

Dredging Research

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Flexible pipeline increases ship channel safety for dustpan dredge operations during marsh creation (Part 2)



Material provided by ERDC Vicksburg, New Orleans District, Louisiana Department of Natural Resources and contract personnel. Timothy L. Welp, Coastal and Hydraulics Laboratory, ERDC-Vicksburg, editor

Editor's Note: The first article under this headline presented an introductory overview of a project about the flexible-discharge dustpan dredge demonstration conducted on the lower Mississippi River during June 5-13, 2002. Part 2 reports on the research aspects of this project.

The navigation channel of the Mississippi River in the vicinity of the Head of Passes is an area where significant shoaling occurs. From mile 4.0 above to mile 1.0 below Head of Passes, the annual dredging volume averages 17,700,000 cu yd. Currently, dredging of the channel there is conducted with hopper dredges, primarily due to their mobility. Cutterhead dredges are considered a safety hazard in this area

due to their inability to rapidly move out of the way of traffic. Hopper dredges move dredged material out of the channel and redeposit it somewhere else in the waterway. There is no beneficial use of the dredged material, unless it is handled again—at additional cost—to get it out of the waterway. Hopper dredges can use direct pump-out to place material in adjacent marsh but have never been used for beneficial use projects at Head of Passes due to the high cost of direct pump-out.

Modified dustpan dredges equipped with flexible-discharge

pipings potentially have the mobility for safe passage of traffic and can economically pump dredged material. In addition, they can pump the material at a longer distance, which is ideally suited for beneficial-use projects such as marsh construction.

Project Objectives

The Louisiana Department of Natural Resources and New Orleans District proposed a project consisting of an innovative application of existing technology. The project therefore offered a field application



Beachbuilder dustpan dredge

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research opportunity under the Dredging Operations and Environmental Research Program's Innovative Technology Task Area. The three agencies decided that the demonstration project should be conducted at the head of Southwest Pass under typical river and navigation conditions that exist during spring when high water results in the greatest current velocities. A bend at the head of Southwest Pass forces traffic to "crab" across the channel for the turn. This maneuver requires more channel width. Shoals build up rapidly in this area and significant sediment is deposited along the inside of the bend. High current velocities put a strain on anchors, cables, push boats, and floating flexible-discharge hose.

The objectives developed for the demonstration project were to:

- ✦ Demonstrate safe navigation and dredging operations of the flexible-discharge dustpan dredge on the Mississippi River in the Head of Passes area. This objective was of primary importance, and if it could not be met, the project was to be terminated.
- ✦ Demonstrate sufficient production capability to dredge and place material in a designated marsh construction site and collect sufficient data to determine cost effectiveness of the technology.

Project Goals

It was determined that certain requirements were key to determining the success of the demonstration and for future implementation of the technology in the maintenance dredging program in this area. Project requirements to be met during the demonstration included:

- ✦ Dredge to a minimum depth of 60 ft below the water surface, resulting in a minimum channel depth of -51 ft Mean Low Gulf (MLG).
- ✦ Pump the dredged material up to a total distance of 15,000 ft.
- ✦ Use total length of flexible floating pipe during dredging

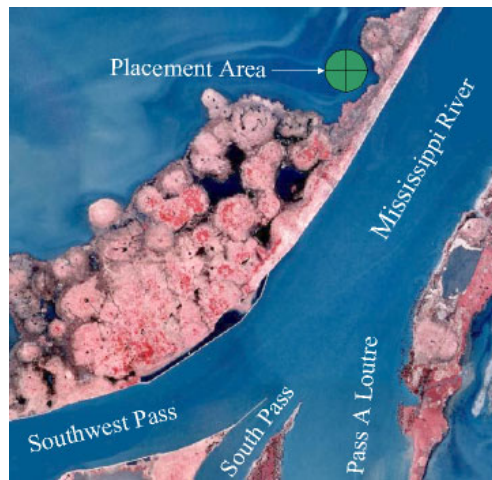


Figure 1. Head of Passes

and moving up and down, and across the channel.

- ✦ Achieve competitive dredging production rates with stoppages required for normal traffic passage.
- ✦ Maneuver into desired dredge cut both horizontally and vertically across the total channel width.
- ✦ Maneuver dredge safely to allow for normal traffic passage.
- ✦ Establish discharge pipeline across dike, adjacent pasture, and existing wetlands to designated placement point(s) with minimum possible impact on existing marsh.
- ✦ Install and operate discharge pipeline with minimal leaks in existing marsh.
- ✦ Secure discharge pipeline in current, using anchor system.
- ✦ Operate and safely maneuver discharge pipeline in the Mississippi River under typical conditions to allow for passage of both shallow-draft and deep-draft vessels.
- ✦ Pump and place dredged material so as to create a suitable marsh area with minimal impact to existing marsh.

Site Location

At Southwest Pass (Fig. 1), the channel is 750 ft wide, with a design depth of -51 ft MLG. The project area was divided into three

dredging reaches. The first reach was selected as the starting location for demonstration of equipment mobility since it was located upstream of the bend where the dredging method could be tested in a less "navigationally constricted" area. The project plan specified working these different reaches in sequence to minimize downtime for moving the hard point and adding submerged pipe.

The placement area for the dredged material for the marsh creation was located on the west side of the river at Mile 1.6 above Head of Passes. The area is in open water immediately west of the channel bank revetment. The bank revetment in this area is narrow, minimizing the amount of pipe needed to reach the discharge area. A minimal amount of open water was left between the channel bank and the placed dredged material to protect existing marshland.

Site Conditions. Dredging activities coincided with the normal period of high water on the Mississippi. The stage hydrograph in Fig. 2 from the District's Venice, La., Station 01480 (located at Mile 10.7 on the Mississippi River) shows the river high/low stage cycles over last 9 years (maximum allowable number of years to plot by the analysis routine). It can be seen that the highest river stage attained during the demonstration was 4.95 ft (National Geodetic Vertical Datum). This is the highest river stage recorded since Jan. 20, 1983, when a river stage of 5.15 ft was measured. Thus, the maximum river stage measured during the demonstration confirms that the dredge was indeed tested in high water.

Currents. The average current speed measured during the project was 3.8 feet per second (fps), with a maximum speed measured of 7 fps. The high sediment load resulted in the continuous deposition of large amounts of sediment, causing rapid formation of shoals. Four hopper

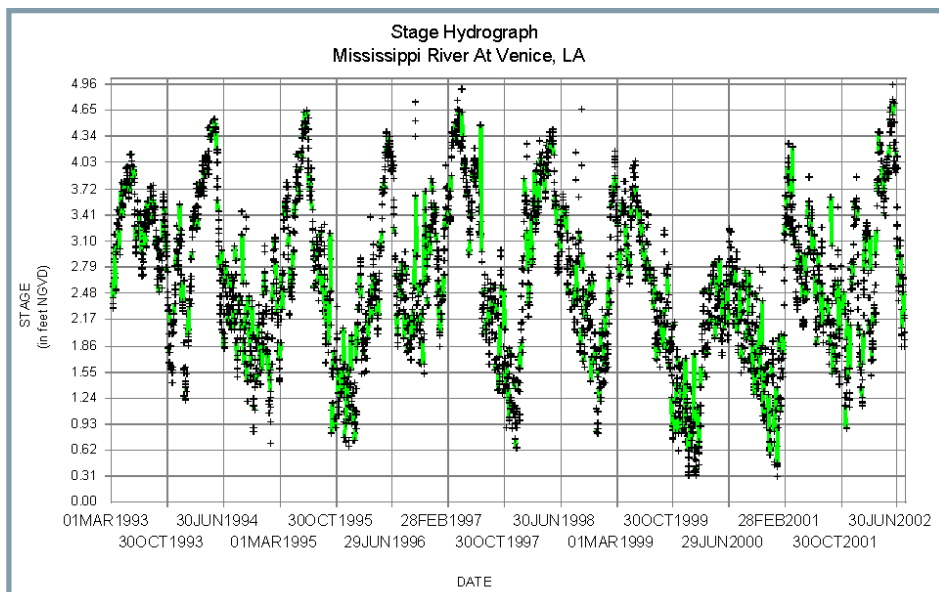


Figure 2. Venice Station stage hydrograph (March 1993 thru July 2001)

dredges were working continuously in this area to remove shoals before they could impact navigation. Shoal thickness was greatest on the inside of the bend, or Right Descending Bank, with areas approximately 20 ft thick.

Water Depth. The water depth in the placement area ranged from 4 to 6 ft. The channel bank and adjacent pasture separating the river and the placement area were approximately 900 ft wide, consisting of a rock face adjacent to the river. The remainder was a sandy soil, with a 2- to 3-ft maximum elevation above the river surface. The soil portion of the pasture was vegetated with short grass, small bushes, and marsh grass adjacent to open water on the west side.

Vessel Traffic. River traffic during the demonstration project was typical according to river pilots. Traffic averaged 20 to 25 deep-draft vessels per 24-hr period. In 6 days during the demonstration, 143 vessels with drafts greater than 20 ft passed. The traffic was not evenly spaced. Several times during the project, two deep-draft vessels passed abreast in the area of the channel where the *Beachbuilder* was working (Fig. 3).

Shallow-draft traffic consisted of tugs, shrimp boats, workboats,

fishing boats, and pleasure boats. This traffic moved unimpeded both in and out of the channel during dredging operations. Outside the channel, shallow-draft traffic moved across the submerged discharge pipeline on the Right Descending Bank side of the channel. No count of shallow-draft traffic was maintained during the project.

Dustpan Dredge. The dustpan dredge *Beachbuilder* used for the demonstration project is a nonself-propelled dredge. The dredge hull

is approximately 300 ft long and 75 ft wide (pictured on the cover). The maximum draft of the dredge is approximately 8.5 ft. The maximum dredging depth of the *Beachbuilder* is approximately 70 ft. The dustpan head is 40 ft wide. The ladder on the *Beachbuilder* is equipped with a submerged pump that transfers the slurry from the head to twin pumps on deck. Total pumping capability is approximately 9,000 hp (two 3,600-hp dredge pumps and an 1,800-hp ladder pump). Dredge pump discharge diameters are 30 in. The *Beachbuilder* was designed to conduct beach nourishment projects where long-distance pumping is needed.

The *Beachbuilder* normally operates using wire rope to advance into a cut. The dredge is equipped with six winches (three forward and three aft) that pull against 11,000-lb anchors to affect movement. Due to the strong current and requirement for rapid movement, a tug was connected to the stern to help propel the dredge (Fig. 4). During the project, it was determined that with the aid of the tug, the dredge could be advanced using only two forward winches with anchors set outside the Left and Right Descending Banks channel toes. Also during the



Figure 3. Ships passing abreast at the Head of Passes

project, a second tug was connected to the starboard side of the dredge to aid in movement in and out of the channel.

The *Beachbuilder* is equipped with state-of-the-art navigation, positioning, and dredge production displays that show equipment gauges, dredge position relative to the work area, dustpan-head elevation, and production parameters. Project hydrographic survey data are uploaded daily to a proprietary computer program that develops an area depth/sediment thickness contour plot.

Flexible, Submerged, and Shore Pipeline. The discharge pipe on the *Beachbuilder* was attached to a flexible floating hose (Fig. 5) that allowed the dredge to move back and forth across the channel while continuing to operate. The hose was made up of 30-ft sections for a total length of 1,420 ft. This length of hose allowed the dredge to move across the full width of the channel and up and down the channel approximately 1,500 ft. Each section has an inside diameter of 30 in. (750 mm) and a bladder on the outside with sufficient buoyancy to float the hose when filled with dredged material. An anchor barge, or skidder, and a small tow were used to hold the floating hose in position to reduce the stress on the hose connections due to the strong current. The floating hose was connected to a “hard point” located on the Right Descending Bank side of the channel. The hard point is



Figure 4. Stern tug used to maneuver *Beachbuilder*

an anchored floating adapter used to connect the floating hose to the submerged steel pipe. The hard point was anchored by a 10,000-lb anchor and was moved and re-anchored as required to allow the dredge to work in specific reaches. In moving the hard point, steel pipe was added or subtracted to reach the new anchor point.

The steel pipe, or “submerged pipe,” ran on the bottom of the river from the hard point to the dike. The total length of submerged pipe ranged from 4,320 to 7,920 ft during the project based on the hard point location. The shoreline steel pipe ran across the channel bank revetment and into the marsh-creation placement area. As the placed dredged material built up above the surface of the water in the placement area, additional shoreline was added to extend the placement further into the area (Fig. 6). Two hydraulic backhoes mounted on swamp tracks (swamp buggies) were used to move the pipe and build temporary dikes in

the placement area to direct discharge flow. No other containment structures were used in the marsh-creation placement area.

Support Equipment. A variety of support equipment was used during the demonstration project. The tug *Delta Eagle* (3,000 hp) was originally connected to the stern of the *Beachbuilder* as a push boat. Due to the swift current and problems with the anchors slipping, the *Delta Eagle* was replaced by the *Delta Pacer* (4,200 hp). The *Delta Eagle* was then connected to the starboard side of the *Beachbuilder* to help maneuver the dredge in and out of the channel. The *Delta Eagle* was later replaced with the *Matthew* (3,000 hp) contractor tug. Two smaller tugs, the *Delta Fox* (900 hp) and *Delta Robin* (600 hp), were used to move several support barges, including one equipped with a 55-ton capacity crane used to lift pipe, and a small A-frame barge (or stiff-leg derrick) used to move anchors and the hard point. The tugs were also used to hold the



Figure 5. Anchor barge (skidder) holding floating hose and hard point



Figure 6. Shore pipe with marsh buggy in background

floating hose in position. A small tug, the *Marie* (300 hp), was used to ferry personnel and help move the small barges. The survey boat used was the *Sabine*.

Data Collection

The data collection program was designed to provide information for evaluating this dredging methodology’s ability to meet the two primary objectives developed for the demonstration project. The various onboard-dredge, dredging prism, hydrographic, and placement area parameters monitored during the demonstration are listed in Table 1. In addition to these types of data, a survey was conducted of the Mississippi River Bar Pilots about the navigation safety aspects of operating this type of dredge on the river.

Dredging Operational Characteristics Analyses

Dredge operational characteristics analyses were conducted to determine the *Beachbuilder*’s ability to dredge and place material in a designated marsh construction site, and to provide the Corps’ New Orleans District personnel with production information upon which to base cost estimates for evaluating the feasibility of using this dredging method at the Head of Passes and other sections on the Mississippi River. These analyses addressed the aspects listed in Table 2.

The dredge maneuvering characteristics were determined by calculating the respective characteristic components from data reduced from the contractor’s daily dredge report and daily submittals on

Engineer Form 4267, “Report of Operations - Pipeline, Dipper, or Bucket Dredges,” supplemental notes taken by the Corps and contractor personnel, and time-series data of the dredge or dustpan x,y,z position, slurry density, and velocity. The production characteristics were analyzed using these types of data, in addition to the hydrographic surveys.

Production Results. During the demonstration, the *Beachbuilder* dredged approximately 222,079 cu yd of sediment (as determined by surveys in the placement area) and placed it in the designated marsh construction site. The project requirements were met, although the maximum pumping distance was 10,820 ft; the additional pipe available for the job was not required. The dredged material was pumped the total distance using the ladder pump and only one of the two deck pumps. As a result, it is assumed that a total pumping distance of 15,000 ft could be achieved. The flexible hose worked well with no leaks or breaks, even after a shrimp boat ran over it.

The average production rate of the entire demonstration between the beginning and end of dredging (192 hr) to move 222,079 cu yd was 1,157 cu yd/hr or 27,768 cu yd/day. After experimenting with maneuverability and gaining dredging experience in Reach 1, a total of 128.5 hr was spent at Reach 2 dredging 205,544 cu yd for an average production rate of 1,606 cu yd/hr (or 38,390 cu yd/day). The average production rate of the dredge while advancing was 2,346 cu yd/hr,

with a maximum rate achieved of 4,559 cu yd/hr. The dredge achieved an average advance speed of 2.1 ft/min.

Maneuverability. The *Beachbuilder* demonstrated the capability to cease dredging and move from one side of the channel to the other in 11 min. The dredge achieved an average speed of 74 ft/min to back down and reset for each cut. A continuous dredging capability was demonstrated when the *Beachbuilder* was operating in the Right Descending Bank half of the channel. Single deep-draft traffic safely passed in the other half of the channel with the *Beachbuilder* dropping its cross-channel anchor wire and picking it back up after the traffic cleared. Forward movement into the cut was maintained by the push tug. Travel back into the Right Descending Bank side of the channel due to traffic was conducted if dredging operations were ongoing in the Left Descending Bank side of the channel, if two vessels passed each other in the channel abreast of the dredging area, or if the river pilot in command of the vessel requested additional clearance.

Overall Demonstration Evaluation

The flexible-discharge dustpan dredge demonstration project conducted in the Head of Passes area on the Mississippi River successfully met the project objectives. The *Beachbuilder* demonstrated safe navigation and dredging operations. The consensus of the

Table 1. Data collection parameters		
Onboard <i>Beachbuilder</i>	Dredging Prism	Placement Area
Date, time Slurry pipeline velocity x,y,z, positioning of dustpan Pump vacuum Discharge pressure Production rate Slurry density USACE daily logs Daily dredging report Form 4267 daily report	River stage River surface currents Hydrographic surveys Sediment samples	Hydrographic surveys

Table 2. Dredging Operational Characteristics	
Dredge Maneuvering	Dredge Production
Time interval for moving the hard point. Actual time intervals for handling anchors. Amount of delay when dredging is halted for vessel passage broken down into different locations (i.e., right or left descending banks of the channel) and different-sized vessels. Amount of time to back down and reposition for each cut. Cross-channel maneuvering capabilities (lateral maneuvering speed).	Individual advance rates per cut and average for entire project. Average bank height for each advance. Production and production rate for each advance. Average production rates.

New Orleans District personnel and the river pilots was that the dredging operation was safe with respect to traffic moving up and down the river. The June 2002 flexible-dustpan dredging demonstration project illustrated that the *Beachbuilder*, or a similar dustpan dredge, can work safely at the Head of Passes and move large volumes of dredged material out of the channel for the beneficial use of marsh creation. The dredged material can be transferred long distances by pipeline across the existing dikes and directly discharged into the marsh without need for re-handling or construction of disposal facilities. A dustpan dredge would prove most efficient at the Head of Passes, working on the Right Descending Bank side of the channel (inside of the bend) where the thickness of the sediment tends to be the greatest and the dredge can operate almost continuously while allowing passage of most deep-draft traffic.

The flexible-discharge hose allows the dredge to move across the total width of the channel but limits its movement up and down the channel based on the total length of the hose. Movement

beyond this range, if only one hard point and submerged pipeline are used, requires interruption of dredging operations while the hard point is moved and submerged pipe added or removed (the use of multiple hard points/discharge lines was not investigated during the demonstration). As a result, the dustpan discharge line configuration, as used in this demonstration, is most efficient where continuous adequate shoal thickness is available and minimal movement of the hard point is required. The dustpan would not be as efficient in addressing spot shoaling over long distances up and down the channel requiring frequent movement of the hard point and associated piping. Such conditions would be more efficiently addressed using hopper dredges. The demonstration project also illustrated that a flexible-discharge dustpan and hopper dredges can work safely together in the same channel reach. A flexible-discharge dustpan dredge could effectively dredge in other reaches

of the Mississippi River and in other navigation discharge configurations. In addition to maintenance dredging, the flexible-discharge dustpan dredge would be effective for use in special dredging projects (with free-flowing, relatively noncohesive material) such as construction and maintenance of sediment traps.

The complete report, currently in preparation, compares the results of the flexible-discharge dustpan demonstration to the "Assessment of Coastwide Louisiana Maintenance Dredging Capabilities Under the Federal Standard" (1998) report evaluation factors. With the conditional exception of mobility between dredging assignments and regions, the *Beachbuilder* appears to have met, or exceeded, the 1998 report evaluation requirements. The new report provides additional discussions of potential improvements for future projects. Once the report is available online, a notice will be placed in *Dredging Research*.

Additional information is available from Jim Clausner at James.E.Clausner@erdc.usace.army.mil and by viewing Part 1 in *Dredging Research*, Vol 5, No. 3, <http://www.wes.army.mil/el/dots/pdfs/drv5n3.pdf>

Editor's Note: The (surely eagerly) awaited second part of the article "Worm gut fluids may yield key to assessing contaminant bioaccumulation potential on dredged materials" was to report on the results of the laboratory analyses of the study introduced in Vol 5, No. 3, September 2002, *Dredging Research*. Unfortunately, the current restraints on funding did not allow that part of the research to go forward as scheduled. A decision was made to publish part two in the June 2003 issue of *Dredging Research*. Many thanks for your patience and interest in our products.

Articles for *Dredging Research* requested:

Dredging Research is an information exchange bulletin for publication of ERDC-generated dredging research results. Included are articles about applied research projects. The bulletin serves all audiences and is accessible on the World Wide Web in addition to a paper circulation of 2,800.

Articles from non-ERDC authors are solicited for publication, especially if the work described is tied to the use of ERDC-generated research results. Research articles that complement ERDC research or cover wide field applications are also accepted for consideration. Manuscripts should use a nontechnical writing style and should include suggestions for visuals and an author point of contact. Point of contact is Elke Briuer, APR, at Elke.Briuer@erdc.usace.army.mil.



January 12-16 - TRB 82d Annual Meeting 2003. The Marriot Wardman Park, Omni Shoreham, and Hilton Washington hotels in Washington, DC, host more than 450 formal sessions and 300+ committee meetings. More than 8,500 transportation professionals from the United States and abroad are expected to attend. More information can be found at <http://www4.nas.edu/trb/annual.nsf/web/homepage?OpenDocument>

March 3-6 – (NOTE: For Corps employees only) Research Program Review for the LEDO, DOER, and DOTS Programs, and USACE Contaminated Sediments Assessment and Management Training, will be held at the Embassy Suites Downtown, Denver, CO. Hotel cost is \$112/night (single), \$132/night (double), or current Government rate. Final room registration date is Feb. 3, 2003. Tel: 303-297-8888. POC: Billie Skinner at skinneb@wes.army.mil

March 30-April 3 - 13th International Harbour Congress Provincial House, Antwerp, Belgium. For further information contact: Ms. Rita Peys, Conference Manager, Technological Institute - - KVIV Ingenieurshuis, Desguinlei 214, B-2018 Antwerp, Belgium. Tel: +32 3 260 08 40, fax + 32 3 216 06 89, e-mail rita.peys@ti.kviv.be, e-mail hav@conferences.ti.kviv.be, www.ti.kviv.be/conf/haven.htm

April 13-16 - Inaugural National Conference on Coastal and Estuarine Habitat Restoration, Baltimore, MD, Hyatt Regency Inner Harbor. The conference is the first nationwide forum focused solely on the goals and practices of coastal and estuarine habitat restoration. POC: Rick Bates, Development Director at Restore America's Estuaries. Tel: 703-524-0248, e-mail rickbates@estuaries.org

April 30, 2003 - Deadline for abstracts

June 30, 2003 - Replies to authors

November 30, 2003 - Deadline for full papers

August 2-6, 2004 - International Symposium on *Sediment Transfer through the Fluvial System*, Moscow, Russia. Sponsored by The International Association of Hydrological Sciences (IAHS), International Commission on Continental Erosion (ICCE), and co-sponsored by Moscow State University. POC: Valentin Golosov or Vladimir Belyaev at Telephone 007-095-9395044, Fax 007-095-9395044

May 12-14 - In-situ Contaminated Sediment Capping Workshop, Cincinnati, Ohio. Sponsored by EPA, USACE, and NOAA. POC: Donna Peterson, EPRI Processing, 1355 Willow Way, Suite 278, Concord, CA 94520-5728, e-mail meeting@epri.com.

May 26-28 - 2d International Symposium on Contaminated Sediments. Loews Le Concorde Hotel, Quebec City, Canada. Sponsors: ASTM, CGS, CSCE, SRA-SETAC. POC and information can be found at http://www.scs2003.ggl.ulaval.ca/SCS2003_English.pdf

June 4-6 2003 - OI Americas 2003. Morial Convention Center, New Orleans, LA. To receive further information contact: www.woda.org or CEDA, P.O. Box 488, 2600 AL Delft, The Netherlands. Tel: +31 15 278 3145, fax +31 15 278 7104, e-mail ceda@dredging.org

June 11-13 – WEDA XXIII and Texas A&M's 35th Annual Dredging Seminar, Chicago, IL. Program theme is *The Dredging Contractor*. For additional information contact Lawrence M. Patella. Tel: 360-750-0209, fax 360-750-1445, or visit www.westerndredging.org

Workshop on Environmental Stability of Chemicals in Sediments Planned for April 8-10

An intensive 3-day workshop on environmental stability of chemicals in sediments is planned April 8-10, 2003, at the Wyndham San Diego at Emerald Plaza in San Diego, California.

To learn more about the workshop, you can download the workshop announcement, agenda, and registration form at <http://www.smwg.org>.

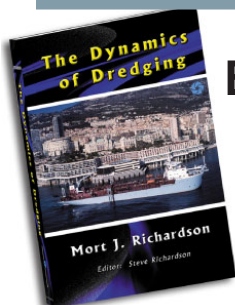
The conference will feature panels of recognized government, academic, and industry experts on various aspects of contaminated sediments in facilitated discussions. Presentations and conclusions will be posted on the web after the conference on <http://www.sediments.org>.

Attendance is open to the public, but aimed at those interested in the management of contaminated sediments. The conference sponsors are the U.S. Environmental Protection Agency, the U.S. Army Corps of Engineers, the U.S. Navy, the South/Southwest Hazardous Substances Research Center, the National Oceanic and Atmospheric Administration, the U.S. Geological Survey, and the Sediment Management Work Group (<http://www.smwg.org>).



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Book on dredging, dredges, and technologies now published

The Dynamics of Dredging is a recently published book by Mort J. Richardson. The book addresses major themes of dredging such as history; major projects of the 20th Century; maintenance dredging of ports, waterways, and reservoirs; dredge mining; technological development; and research. Information about overseas projects and technology is also included.

For more information, contact the author at worldredging@aol.com or write to World Dredging, P.O. Box 1749, Irvine, CA 92623-7479.

Dredging Research

This bulletin is published in accordance with AR 25-30 as an information dissemination function of the Environmental Laboratory of the U.S. Army Engineer Research and Development Center. The publication is part of the technology transfer mission of the Dredging Operations Technical Support (DOTS) Program and includes information about various dredging research areas. Special emphasis will be placed on articles relating to application of research results or technology to specific project needs. The contents of this bulletin are not to be used for advertising, publication, or promotional purposes. Citation of trade names does not constitute an official endorsement or the approval of the use of such commercial products. Contributions are solicited from all sources and will be considered for publication. Editor is Elke Briuer, APR, Elke.Briuer@erdc.usace.army.mil. Mail correspondence to the Environmental Laboratory, ATTN: DOTS, Dredging Research, U.S. Army Engineer Research and Development Center, Waterways Experiment Station (CEERD-EM-D), 3909 Halls Ferry Road, Vicksburg, MS 39180-6199, or call (601) 634-2349. Internet address: www.wes.army.mil/el/dots/drieb.html.


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**USACE/ US NAVY/ S-SW HSRC / USEPA
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An Intensive 3-Day Workshop on
Environmental Stability of Chemicals
in Sediments**

April 8 - 10, 2003

*Wyndham San Diego at Emerald Plaza
San Diego, CA*

Objective: Conduct a 3-day workshop on the important biogeochemical and physical factors that modify the stability, mobility, and/or bioavailability of inorganic and organic contaminants in aquatic sediments; to explore the fate, effects and risks of sediment bound contaminants; to agree on general yet pragmatic guidelines for the assessment and management of contaminated sediments that may pose an unacceptable human health and/or environmental risk by answering the following questions:

- o How do we integrate our knowledge of sediment chemical stability to make pragmatic field decisions on the appropriateness of in-place remediation, sediment removal or natural recovery?
- o What should we measure to adequately assess before the fact and to quantify success after the fact?
- o Where and how should we measure?
- o How do we predict contaminant fate and associated risks within reasonable certainty?

Who: Panels of recognized government, academic and industry experts on various aspects of contaminated sediments

How: Facilitated discussions on subject areas leading to conclusions that can be applied to "real world" situations; posting presentations and conclusions on the Web <www.sediments.org>

Attendance: Open to public, but aimed at those interested in the management of contaminated sediments.

DETAILED AGENDA (attached)

Cost: \$225 - includes meeting materials, continental breakfasts (April 8-10) and lunch on April 9.

ON-LINE REGISTRATION FORM (see link at www.smwg.org)

Reservations for the hotel:

Call 1.619.239.4500 or toll-free: 1.800.996.3426 and identify yourself as attending the Sediment Workshop in order to obtain the group rate of \$199/night for non-government or the prevailing government rate for government employees

Additional hotel information: www.wyndham.com/emeraldplaza

*The cooperating group includes: the U.S. Army Corps of Engineers, the U.S. Navy, the South/Southwest Hazardous Substances Research Center, the U.S. Environmental Protection Agency, the National Oceanic and Atmospheric Administration, the U.S. Geological Survey and the Sediment Management Work Group.

ENVIRONMENTAL STABILITY OF CHEMICALS IN SEDIMENTS WORKSHOP

Wyndham San Diego at Emerald Plaza

San Diego, CA - April 8-10, 2003

REGISTRATION FORM

Please fill out the registration form and submit electronically (located at www.smwg.org) or via fax to 313.465.7493. Please note the instructions for payment by check at the bottom of the form. We are unable to accept credit card payments. The cost of the seminar is \$225 and includes meeting materials, continental breakfast on the April 8-10, and lunch with a keynote speaker on April 9th. Thank you.

Please provide the following contact information:

Note: *denotes a required field

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**NOTE – IF YOU ARE A GOVERNMENT EMPLOYEE PAYING WITH A
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Please mail your
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Sediment Management Work Group
c/o Honigman Miller Schwartz and Cohn LLP
660 Woodward Ave., Suite 2290
Detroit, MI 48226

For additional information, please contact: Susan Vasich, Assistant to Steven C. Nadeau, phone: 1.313.465.7978 - facsimile: 1.313.465.7493 - email: smv@honigman.com